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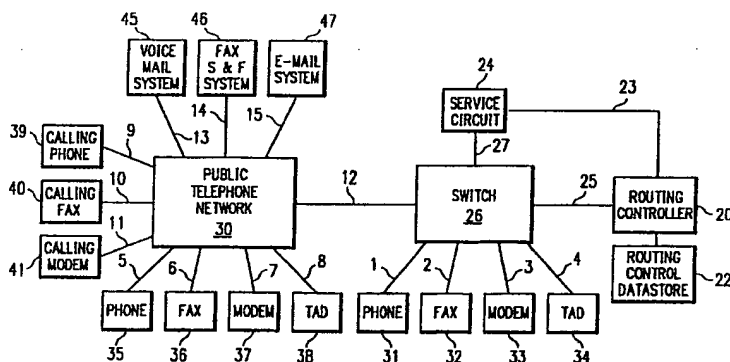
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(54) Title: SINGLE NUMBER INFORMATION EXCHANGE ROUTING PROCESS



(57) Abstract

A method is disclosed for telecommunication call routing that facilitates person-to-person and person-to-machine information exchange transactions by means of telephone circuits (30). The method provides convenient, round-the-clock access to callers with convenient control by the called party. By placing a single telephone call to a special telephone number that invokes the disclosed process, termed the Process Trigger Identifier or PTID, a caller can talk directly with the Owner assigned the PTID anywhere that Owner has access to telephone whether at work, at home, in the car, or travelling. Alternatively, a caller can leave a voice (45), facsimile (46), paging, or electronic mail message (47) for the PTID Owner again by placing a call to the PTID of the Owner. A caller is able to accomplish this communication of information with the PTID Owner without need for third-party human intervention such as is typically provided by a secretary or receptionist. The PTID Owner controls what alternatives are available to callers and can conveniently modify these alternatives. The method permits the introduction of voice and data integrated information services to current telephone subscribers while using conventional customer premises terminal device equipment (i.e., telephones (31), modems (33), and facsimile units (32)), and by encompassing providers of information services within its framework. The process can function equally well in customer premises terminal equipment, customer premises switching equipment (26), and central equipment office switching equipment (30).

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SINGLE NUMBER INFORMATION EXCHANGE ROUTING PROCESS

BACKGROUND OF THE INVENTION

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This invention relates to telecommunication call routing and particularly to a process that facilitates transactions involving person-to-person and person-to-machine exchange of information over telephone circuits.

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The exchange of information by telephone between people is fundamental to business. Consequently, improvements that permit the more efficient use of the real-time of both calling and called parties involved in telephone information exchange transactions have significant value to business people.

15

Heretofore, business people have been confronted with four primary challenges in accomplishing telephone information exchange transactions with one another: first, acquiring and maintaining up-to-date telephone access information; second, conveniently connecting with a called party via telephone circuit; third, assuring that desired information is exchanged in a single call; and fourth, providing the potential called party with convenient control over who can access by telephone circuit and how the access is to be accomplished.

25

Today, business people must develop and maintain sizable lists of telephone numbers of persons with whom they wish to communicate. Such lists typically include prospective, current and past clients, business networking contacts and business associates. To complicate matters, multiple telephone numbers frequently need to be maintained for each individual on the list (e.g., work phone, home phone, mobile phone, secretary phone, pager, facsimile, etc...) due to the nature of today's on-the-go

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- 2 -

business person and the rapid growth in usage of new telephone technologies.

5 There are a few approaches and commercial products that can
mitigate this proliferation of telephone numbers somewhat. For
example, most businesses now have a minimum of two telephone
numbers, one for voice telephone calls and the other for facsimile
calls. One mitigating approach is to share a common telephone line
10 between both the telephone and the facsimile terminal so that a
single telephone number suffices for access to either device.
However, to accomplish this conveniently a capability is needed that
differentiates between incoming voice calls and facsimile calls and
switches to the appropriate terminal device without requiring
intervention by an individual at the called number. Commercial
15 devices are available that provide such a capability. These devices
work by first attempting to detect an incoming facsimile calling tone
for a period of four to five seconds and then either assuming a voice
call or using caller entered a Dual-Tone, Multi-Frequency (DTMF)
digits to specify the type of terminal device required. This delay is
20 an inconvenience to a human caller. Another drawback is that there
is no convenient mechanism to give the caller an alternative if the
line is currently busy. For example, call forwarding of incoming calls
on busy to voice mail is problematic since there is no way of telling
if the call is voice or facsimile. Finally, this approach is not viable
25 when the facsimile is used heavily thereby warranting a separate
telephone line for the facsimile device anyway.

Such approaches are piece-meal and were really never intended
to confront the telephone number proliferation issue. There is
30 currently no viable comprehensive solution to this problem.
Consequently maintaining up-to-date telephone lists has become
a logistics nightmare. Today as business organizations attempt to
speed up business functions, the lack of updated telephone
access numbers is becoming a heavy burden both in terms of
35 cost and competitive advantage. With increasing frequency
callers find themselves with out-of-date phone numbers and

- 3 -

burdened with tracking down the phone number of a desired party. Indeed, the activity of tracking down a phone number is almost accepted as a standard part of doing business requiring numerous phone calls even when the search is restricted to a single physical location. For example, in order to send a facsimile copy, one first must obtain the phone number of the destination facsimile machine typically by phoning a secretary at the destination; then a second call is required to transmit the facsimile itself.

10

Even when the caller has obtained the pertinent telephone access numbers, he/she is still confronted with the task of making telephone contact with the desired called party and then accomplishing the desired information transfer. Typically, a caller is thwarted because the party being called is not accessible at the called phone number. For example, the called number may be busy, the called person may not be in the office or may be involved in a meeting, or the called facsimile machine may be turned off.

20

Currently, there are numerous disparate approaches that are invoked to handle such eventualities and accommodate information exchange transactions by telephone. All of these alternatives have varying drawbacks to the calling and/or called parties. Some examples follow.

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The most comprehensive approach is the use of a competent secretary who is capable of screening calls, taking messages, making decisions on message priorities and knowing when to interrupt meetings or pass appropriate telephone numbers to a caller. The obvious drawbacks are that secretaries go on break, get sick and are not typically available outside business hours.

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Business people use private telephone lines to permit valued customers to bypass secretarial screening of incoming calls. The ability to bypass secretarial screening becomes a drawback when

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- 4 -

the called party no longer has control over who can call and when the call will occur. Another drawback is that when the business person with the private line is unavailable to answer a call, the private line typically does not have human coverage
5 requiring a caller to place another call to a secretary. Furthermore, the existence of the private line means yet another telephone number for callers to remember.

Voice mail and telephone answering machines are available for
10 leaving messages around-the-clock, unless the caller happens to access a telephone answering machine while it is busy. Voice mail is frequently used in conjunction with call forwarding to permit callers to leave messages when the called number is busy or does not answer. Voice mail is also frequently used by
15 business to broadcast information since it disperses messages much more rapidly than the traditional typed memorandum or the error-fraught, word-of-mouth approach. Drawbacks are limited call screening ability, no ability to prioritize messages, and no ability to provide appropriate response in case of
20 emergencies or access by valued clients. Furthermore, voice mail capability requires another telephone number for callers to remember.

To optimize accessibility, business people can use call forwarding.
25 Call forwarding is convenient to a caller in that the called party can be accessed by placing a single call to the call forwarding station and the caller does not need to know the actual location of the called party. A drawback is that call forwarding does not permit screening of the caller such as a secretary might
30 otherwise perform. In addition, if a caller attempts to access while the call forwarded number is busy, the caller will be unable to conveniently leave a message for the intended party. Finally, if the business person is moving around frequently, constantly updating all digits of each new call forwarded
35 telephone number at each move becomes cumbersome and the

- 5 -

opportunity for errored entry of the call forwarded number rapidly increases.

5 Another alternative to the problem of telephone access is the use of paging devices. Such devices increase dramatically the ability to connect with the called party. One drawback to pagers is their lack of reliability in areas with limited radio coverage. Another drawback is that business people do not like using pagers because of inability to control paging prompt distraction during
10 meetings. Furthermore, paging devices mean another telephone number for callers to remember.

Business people continually encounter these approaches as they perform their day-to-day business activities. Each alternative
15 presents a different interface to users and requires a different user methodology to bypass drawbacks of the approach and to accomplish a successful information exchange transaction. In addition, as new telephone technology enters the market not only will telephone number proliferation increase but also users
20 will be confronted with still more disparate alternatives with which they must interact.

What business people need is a uniform solution to the problems associated with information exchange transactions via telephone
25 that is not subject to the drawbacks that these disparate alternatives have individually but integrates them in a manner that is convenient for callers to use at anytime, is convenient for the called party to control and will accommodate new telephone technology alternatives.

30

Business users, therefore, would find a process that would facilitate information exchange transactions using telephone circuits by remedying the above problems and others to be of great value and the disclosed process meets these needs.

- 6 -

SUMMARY OF THE INVENTION

In accordance with the present invention there is provided a routing process wherein by placing a single call to a special telephone number, termed a Process Trigger Identifier or PTID, the disclosed routing process is invoked. Upon invoking the routing process, a caller can access and talk directly with the person assigned the PTID, termed the PTID Owner, anywhere that the PTID Owner has access to a telephone whether it be at home, at work, in the car, or traveling. Consequently, the caller no longer has to keep track of a multitude of phone numbers; the PTID is sufficient. The disclosed process accomplishes this without need for third-party human assistance such as a receptionist or secretary.

Further, in accordance with the present invention, by placing a single phone call to one PTID a caller can leave a message for the PTID Owner if the Owner is unavailable for a voice call or the caller wishes to leave a voice message, facsimile, electronic mail message, or page the PTID Owner. Consequently, the caller no longer has to keep track of additional phone numbers for paging, facsimile and electronic mail; again, the PTID is sufficient. The disclosed process accomplishes this without need for third-party human assistance. In the event that the message device is busy or otherwise unable to receive a message from the caller, the process provides a backup message capability that functions transparently to the caller. The process also alerts users of and provides convenient retrieval of voice, facsimile, or electronic mail messages stored for the PTID Owner.

The present invention also provides the PTID Owner with convenient control over the alternatives available to callers. The PTID Owner is able to specify access destinations available to callers and is responsible for keeping associated destination telephone numbers current. Consequently, callers do not have to be informed of updated telephone numbers; all changes are

- 7 -

transparent to callers and hidden behind the single PTID. The PTID Owner is able to control caller access by means of caller screening that is convenient to the caller. The PTID Owner also is able to specify what to do when an accessed destination is busy or does not answer.

The present invention also provides a base for the introduction of integrated (voice and data) information services to current telephone subscribers. Consequently, the process supports conventional customer premises equipment such as telephones, modems, and facsimile units. Additionally, the process supports providers of services such as telephone answering services, voice messaging services, and facsimile messaging services. The process functions in customer premises terminal equipment, customer premises switching equipment such as keysets and Private Branch Exchanges (PBXs), and central office switching equipment.

BRIEF DESCRIPTION OF THE DRAWINGS

- FIG. 1 shows, in block diagram form, a configuration of public telephone network, terminal devices, switch, service circuit, routing controller and routing control datastore to illustrate the components with which the disclosed process interacts.
- FIGS. 2a, 2b, 2c, and 2d illustrate a route table containing information used by the disclosed process to route an incoming call that accesses a PTID.
- FIG. 3 is a process flow diagram of the operation of the disclosed process that illustrates how the disclosed process initiates its primary functions - Personal Call, Leave Message, Retrieve Message, and Route.
- FIG. 4 is a process flow diagram of the operation of the disclosed process that illustrates an expanded view of the Personal Call function that permits callers to directly access a PTID Owner.
- FIG. 5 is a process flow diagram of the operation of the disclosed process that illustrates an expanded view of the Process PIN Entry function that performs collection and validation of caller screening codes.
- FIG. 6 is a process flow diagram of the operation of the disclosed process that illustrates an expanded view of the Leave Message function that permits callers to leave a message for a PTID Owner.
- FIG. 7 is a process flow diagram of the operation of the disclosed process that illustrates an expanded view of the Retrieve Message function that permits callers to retrieve a message left for a PTID Owner.

FIG. 8 a process flow diagram of the operation of the disclosed process that illustrates an expanded view of the Modify Service function that permits callers to modify the route table of FIGS. 2a and 2b.

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FIG. 9 is a process flow diagram of the operation of the disclosed process that illustrates an expanded view of the Route function that performs route translation and related routing decisions.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1, reference numerals 1 through 4 denote telephone line circuits that interconnect terminal devices to switch 26. For example, line circuit 1 interconnects telephone set 31 to switch 26; line circuit 2 interconnects facsimile device 32; line circuit 3 interconnects modem device 33; and line circuit 4 interconnects telephone answering device 34. Reference numerals 5 through 11 denote telephone line circuits that interconnect terminal devices to central office switches in the Public Telephone Network (PTN) 30. For example, line circuits 5 and 9 interconnect telephone sets 35 and 39 to PTN 30 respectively; line circuits 6 and 10 interconnect facsimile devices 36 and 40 to PTN 30 respectively; line circuits 7 and 11 interconnect modem devices 37 and 41 to PTN 30 respectively; and line circuit 8 interconnects telephone answering device 38 to PTN 30. Facsimile terminal devices 32, 36, and 40 are each capable of receiving and printing or storing facsimile transmissions. Facsimile device 40 also provides automated as well as manual calling capability. Modem devices 33, 37, and 41 are each capable of receiving modem data transmissions. Modem device 41 also provides automated as well as manual calling capability. Telephone answering devices 34 and 38 each have voice recording and playback capability.

Reference numeral 12 denotes one or more telephone trunk or line circuits interconnecting switch 26 with PTN 30. Reference numerals 13 through 15 each denote one or more telephone trunk or line circuits that interconnect messaging storage equipment to PTN 30. For example, circuit 13 interconnects voice mail system 45 to PTN 30; circuit 14 interconnects facsimile store and forward system 46 to PTN 30; and circuit 15 interconnects electronic mail system 47 to PTN 30. Voice mail system 45 records voice messages for and permits retrieval of stored voice messages by multiple users. Facsimile store and forward system 46 receives, stores, and permits retrieval of stored facsimile transmissions by multiple users. Electronic mail system 47 receives, stores, and

- 11 -

permits access to stored electronic mail data transmissions for multiple users.

Switch 26 is a standard central office switch in the embodiment described herein, that connects incoming calls from calling terminal devices 39, 40, and 41 to locally connected terminal devices 31, 32, 33, 34. Switch 26 also routes incoming calls from calling terminals 39, 40, 41 to remote terminal devices 35, 36, 37, 38 and remote messaging storage system equipment 45, 46, 47 either by transferring such calls via facilities of PTN 30 or by setting up and maintaining an incoming and outgoing telephone circuit for the duration of each such calls. As an alternative to the described embodiment, switch 26 could be a customer premises switching device such as a standard PBX or keyset. As another alternative to the described embodiment, switch 26 could be a switching capability implemented in a terminal device to provide simple switching connectivity to alternative terminal devices. An example would be facsimile device 32 with switch 26 as an internal switching capability that permits interconnecting an incoming call to the internal facsimile unit or to externally connected telephone set 31 or to externally connected modem device 33 or telephone answering device 34 or permits forwarding the call to an alternative number.

Reference numeral 25 denotes a data communication link between switch 26 and routing controller 20. Routing controller 20 is a computer processor that contains and executes the software program that implements the disclosed routing process of the present invention. Routing controller 20 controls routing done by switch 26 for incoming calls from calling terminals 39, 40, 41 that access a special telephone number assigned to switch 26 and designated to cause switch 26 to invoke the routing process of routing controller 20. These special telephone numbers are termed Process Trigger Identifiers or PTIDs and one or more of them may be allocated to switch 26. Whenever a PTID is accessed, the routing controller 20 is notified by switch

- 12 -

26 of the accessed PTID via link 25 and switch 26 receives routing commands from routing controller 20 for the duration of the call establishment period. As an alternative to the embodiment described herein, routing controller 20 may be co-located within the same physical equipment as switch 26 so that the routing process communicates directly with internal call processing software of switch 26.

Reference numeral 23 denotes a data communication link between routing controller 20 and service circuit 24. Service circuit 24 provides for the generation of Dual Tone Multi Frequency (DTMF) signalling as well as the initiation and termination of specified speech announcements as directed by routing controller 20 via link 23. Also via link 23, service circuit 24 notifies routing controller 20 of the reception and interpretation of DTMF signalling as well as the detection of facsimile calling tone. As an alternative to the embodiment described herein, service circuit 24 may be co-located within the same physical equipment as routing controller 20 so that the routing process communicates directly with any service circuit internal call processing software. Reference numeral 27 denotes one or more telephone trunks or line circuits that interconnect switch 26 and service circuit 24. Switch 26 connects incoming calls from calling terminals 39, 40, 41 to service circuit 24 when instructed to do so by routing controller 20. As an alternative to the embodiment described herein, service circuit 24 may be implemented as integrated with switch 26.

Reference numeral 22 denotes the routing control datastore that contains the information used by routing controller 20 to determine how to route an incoming call that accesses a PTID. Communication between routing controller 20 and routing control datastore 22 consists of read accesses of and updates to the routing control datastore by the routing controller. Routing control datastore 22 is located within the same processor equipment as routing controller 20 so that the routing process

- 13 -

directly accesses internal data structures of the routing control datastore. As an alternative to the embodiment described herein, routing control datastore 22 may be located on a computer processor that is distinct from that of routing controller 20 so that communication between the routing controller and routing control datastore is accomplished by means of data communication links.

Routing control datastore 22 may also be updated by means of a video display terminal interface and/or personal computer interface independently of the disclosed process. For the described embodiment with switch 26 as a central office switch, all service provisioning and most customer updates will be accomplished using the video display/personal computer interface. Updates to the routing control datastore 22 by the disclosed process permit modification via telephone when the video display/personal computer interface is not conveniently accessible. For example, the PTID owner would use the telephone interface of the disclosed process to make modifications outside of business hours.

Routing control datastore 22 consists of one or more route tables each of which is associated with a PTID. A descriptive example embodiment of a route table is shown on FIGs. 2a through 2d, consisting respectively of Tables 1 through 4. The PTID for which parameters in Tables 1 through 4 are defined serves as the primary access key for the route table. Referring to Table 1 in FIG. 2a, the Access Designation column in Table 1 is comprised of entries that correspond to four modes of access available to a caller termed Access Types: the Personal Call Access Type routes a caller to a destination that has been preselected to assure direct access to the PTID Owner; the Leave Message Access Type permits a caller to specify how to leave a message for the PTID Owner and routes the caller accordingly; the Retrieve Message Access Type permits a caller to specify how to retrieve a message left for the PTID Owner and routes the caller

- 14 -

accordingly; and the Modify Service Access Type permits a caller to modify parameters in Tables 1 and 2. A caller invokes a particular Access Type mode by inputting via DTMF a numeric value equal to the value of the preferred Access Type

5 Designation.

The Access Type Announced column in Table 1 controls what Access Types are included in the prompting announcement requesting Access Type selection that is played to each caller.

10 Each Access Type Designation entry that has announced status (Yes) is included in the prompting announcement; each Access Type Designation that has not announced status (No) is not included in the prompting announcement. An Access Type with not announced status can still be selected by a caller even

15 through it is not included in the prompting announcement. For example, if Modify Service Access Type has not announced status, a caller would not hear any Modify Service Access Type prompt but could still specify and gain entry to the Modify Service function. Most applications will have the Modify Service

20 and Retrieve Message Access Types set to not announced status since the majority of callers need only to interact with the Personal Call and Leave Message Access Types.

Each Access Type Designation entry in Table 1 is in turn

25 comprised of Call Type Designation entries that specify the destinations a caller can access. A particular Call Type is selected by specifying the numeric value of the preferred Call Type Designation. The Personal Call Access Type mode routes a caller according to a prespecified Call Type Designation selected from

30 seven alternative Call Type Designation entries: The Private Line Designation routes a caller to the private line of the PTID Owner; the Local Office Designation routes a caller directly to the local business office of the PTID Owner and is used when the PTID Owner cannot be available to answer the Private Lines

35 Designation calls; the Local Residence Designation routes a caller directly to the local residence of the PTID Owner; the Local Car

- 15 -

- Designation routes to the Owner's mobile phone; the Remote Office Designation routes to an office location where the Owner can be reached while traveling; the Remote Residence Designation routes to a hotel or on-the-road residence; and the
- 5 Remote Car Designation routes to a mobile phone used by the Owner while traveling.

- The Leave Message Access Type mode routes a caller according to the Call Type Designation specified by the caller in response to
- 10 a prompting announcement requesting Call Type selection or according to the Call Type Designation specified in the associated Final Treatment entry of Table 1. Final Treatment will be discussed in more detail later. The caller selects from a list of five alternative Call Type Designation entries: the Secretary
- 15 Designation routes a caller to a secretary or receptionist; the Pager Designation routes a caller to a paging device; the Voice Message Designation routes to a voice recording device such as telephone answer device 34 or 38, or voice mail system 45; the Facsimile Message Designation routes to facsimile device 32 or
- 20 36, or facsimile store and forward system 46; the Electronic Mail Message Designation routes to modem device 33 or 37 or electronic mail system 47. The three Call Type Designations Voice Message Backup, Facsimile Message Backup, and Electronic Mail Message Backup are not intended for selection by callers in
- 25 the Leave Message Access Type mode. Each backup Call Type Designation specifies a backup routing destination in case the primary routing destination of the associated primary Call Type Designation, Voice Message, Facsimile Message, or Electronic Mail Message, does not answer.

- 30
- The Retrieve Message Access Type mode routes a caller according to the Call Type Designation specified by the caller in response to an announcement requesting Call Type selection. The caller selects from a list of six alternative Call Type
- 35 Designation entries: the Voice Message Designation routes a caller to the device specified by the counterpart Leave Message

- 16 -

Access Type - Voice Message Call Type Designation entry;
similarly, each of the other five Call Type Designations Facsimile
Message, Electronic Mail Message, Voice Message Backup,
Facsimile Message Backup, and Electronic Mail Message Backup
5 routes a caller to the device specified by the counterpart Leave
Message Access Type - Call Type Designation entry.

The Modify Service Access Type mode has only a single default
Call Type Designation so that selecting the Modify Service Access
10 Type Designation automatically selects the default Call Type
without any prompting announcement for Call Type selection.

The Call Type Announced column in Table 1 controls what Call
Types are included in the prompting announcement requesting
15 Call Type selection that is played to each caller. Each Call Type
Designation entry that has announced status (Yes) is included in
the prompting announcement requesting Call Type selection;
each Call Type Designation entry with not announced status (No)
is not included in the prompting announcement. A Call Type
20 with not announced status can still be selected by a caller. One
of the Personal Call - Call Types will be prespecified so that no
caller selection is needed and consequently no prompting
announcement is used for Personal - Call Types in Table 1. Also,
since Leave Message - Backup Call Type Designations are not
25 intended for user selection, no prompting announcement is used
for Leave Message - Backup Call Types in Table 1. The Modify
Service Access Type has only one default Call Type so that no
prompting announcement is needed and no Call Type Announced
entry is required in Table 1.

30
The Call Type Enabled column in Table 1 controls what Call Type
Designations are valid selections for a caller during a call. For the
Personal Call Access Type Designation only one Call Type
Designation entry may be enabled (Yes) at a time with all other
35 Personal Call - Call Types being disabled (No). Consequently,
when a caller selects the Personal Call Access Type during a call,

- 17 -

no further Call Type selection prompts occur since the single enabled Call Type is automatically selected without additional caller input. This Personal Call - Call Type capability is much more convenient and less error prone than call forwarding since

5 the appropriate destination telephone numbers have been entered in advance in the Destination Address Field in Table 1 for each possible Personal Call - Call Type. Consequently, only enablement of the desired Personal Call - Call Type Designation is required rather than reentry of a full telephone number on

10 every change of forwarding location as is the case with call forwarding. For Leave Message and Retrieve Message Access Type Designations, enabled (Yes) Call Type Designations can be selected by callers, disabled (No) Call Type Designations cannot be selected by callers. Any number combination of

15 enabled/disabled Call Type Designations are permissible for Leave Message and Retrieve Message Access Types. A Retrieve Message - Call Type may be disabled even through its Leave Message - Call Type counterpart is enabled. As an example consider when Leave Message - Facsimile Message Call Type

20 specifies facsimile terminal 32 as the destination terminal. If facsimile terminal 32 only prints facsimile transmission, there will never be stored facsimile messages to be retrieved by telephone. Consequently, the Retrieve Message - Facsimile Message Call Type would be disabled even though its Leave

25 Message - Facsimile Message Call Type counterpart would be enabled to permit sending facsimile transmissions to the terminal. The Leave Message - Backup Call Type Designations, Voice Message Backup, Facsimile Message Backup, and Electronic Mail Message Backup, are disabled in Table 1 to prevent callers

30 from selecting them; these call types can only be selected by the disclosed process during the final treatment procedure. However, their Retrieve Message counterpart Backup Call Types may be enabled to permit retrieval of messages stored during final treatment. The Modify Service Access/Call Type has been

35 set to enabled status only to prevent callers from inadvertently

- 18 -

changing to disabled status and thereby rendering themselves incapable of any further modifications of service capability.

5 The Timeout Enabled Status Column in Table 1 specifies the
Access Type - Call Type Designation used to route calls in case a
caller makes no Access Type selection within a prespecified time
interval from call initiation. Only one Call Type may be selected
for Timeout routing (Yes) at a time with all other Call Types in
Table 1 being not selected for Timeout routing (No). Retrieve
10 Message and Modify Service Call Type Designations are not
viable time-out designations as indicated in Table 1.

The Screening Code Designation column in Table 1 specifies
screening codes termed Personal Identification Numbers or PINs
15 in Table 1. There are three Screening Code Designation
categories: screening codes for Personal Call and Leave Message
Access Types comprise the first category (PIN 1), codes for the
Retrieve Message Access Type comprise the second (PIN 2), and
codes for the Modify Service Access Type comprise the third
20 (PIN 3). These different screening code categories permit
segmenting access to the different Access Types so that, for
example, a caller having a valid code permitting access to
Personal Call and Leave Message Access Types may not
necessarily access Retrieve Message or Modify Service Access
25 Types. To permit individualized screening on a per caller basis,
multiple Screening Code Designation values are permitted for
Personal Call and Leave Message Access Types. The multiple
PIN1 Screening Code Designation entries for Personal Call and
Leave Message Access Types are maintained in Table 2 of FIG. 2b
30 and are designated PIN 1.1, PIN 1.2, ..., PIN 1.N. This is a
convenience to callers because it permits the use of screening
codes that can be easily remembered by the calling party. The
majority of callers need to interact only with the Personal Call
and Leave Message Access Types; consequently, only a single
35 Screening Code Designation value is used for each of the Retrieve
Message (PIN 2) and Modify Service (PIN 3) Access Types in

- 19 -

Table 1 since these Access Types will generally only be accessed by the PTID Owner or a designee such as a secretary.

- 5 The Screening Code Required column in Table 1 specifies which Call Type Designations require screening code entry (Yes) and which Call Types do not (No). Screening code entry for Modify Service Access Type is always required.

- 10 The Destination Address column in Table 1 contains the destination address that a call is routed to for each Call Type Designation. For the described embodiment wherein switch 26 is a central office switch a Destination Address entry can be either a telephone number or a Service Provider Company (SPC) Code. The telephone number entry identifies the seven or ten digit
15 telephone number of the destination device to be called. The SPC Code capability is appropriate for applications where it may be necessary to designate Service Provider Companies that are providing services such as voice mail, facsimile store and forward or electronic mail to a large number of PTID Owners. For
20 efficiency, a three or four digit SPC code can be used rather than having to repeat the seven or ten digit phone number in every route table that references the SPC Destination Address. The Destination Addresses used for Retrieve Message Access Type - Call Type Designations in Table 1 are the same as the Destination
25 Addresses specified for their counterpart Leave Message Access Type - Call Types in Table 1. For the alternative embodiment with switch 26 as a PBX, seven and ten digit telephone numbers and SPC Codes are also utilized. However, when the destination telephone number is coresident with the PTID on the PBX, a four
30 or five digit telephone number may be used for the Destination Address. For the alternative embodiment with switch 26 as an internal switching capability implemented in a terminal device, seven and ten digit telephone numbers are also utilized. However, a one or two digit local port identifier entry is used to
35 permit routing to a few locally terminated devices. An example would be facsimile device 32 with internal switch 26 for

- 20 -

connecting to the internal facsimile modem or externally
connecting to telephone 31 or to telephone answering device 34;
the internal facsimile modem, the external telephone, and the
external telephone answering device would each have a unique
5 port identifier value.

The Final Treatment Designation column in Table 1 specifies how
to route a call in the event that the originally selected primary
Call Type Designation routes to a destination that does not
10 answer the call within a prespecified time interval. A Final
Treatment Designation entry can be set to indicate no entry so
that no final treatment activity can be initiated. Alternatively, a
Final Treatment Designation entry can be set to the value of a
Leave Message - Call Type Designation. This causes an
15 unanswered call to be routed to the Destination Address of the
Leave Message - Call Type Designation specified as the Final
Treatment Designation in Table 1. For Personal Call - Call Types,
the Final Treatment Designation can be selected from among
three Leave Message - Call Type Designation alternatives:
20 Secretary, Voice Message, and Pager. For each Leave Message -
Call Type, the Final Treatment Designation permits only one
default Leave Message - Call Type Designation: Secretary and
Pager use Voice Message for Final Treatment Designation; Voice
Message, Facsimile Message, and Electronic Mail Message use
25 their corresponding Backup Call Types for Final Treatment
Designation. Leave Message - Backup Call Types cannot initiate
final treatment activity as indicated in Table 1. Retrieve
Message and Modify Service Access Types also have no final
treatment capability in Table 1. The final treatment selection
30 alternatives in Table 1 assure that a sequence of Final Treatment
Designations resulting in an endless loop of invocations cannot be
inadvertently specified.

Referring to Table 3 in FIG. 2c, each entry in the Call Type
35 Designation column maps into its Leave Message and Retrieve
Message - Call Type counterparts in Table 1. Each Message

Announced status entry in Table 3 is an internal variable that is used by the Retrieve Message function to determine what Call Type Designations to include in a prompting announcement listing the Call Types that have been successfully accessed in performing a Leave Message function. If the Message Announced Status is set-on (Yes), the associated Call Type Designation in Table 3 is included in the announcement prompt; if the status is cleared-off (No), the associated Call Type Designation is not included. The value of the Call Type Enabled Status entry for the Retrieve Message - Call Type counterpart in Table 1 determines when the Message Announced Status entry is cleared and consequently how long the Call Type Designation is included in the Retrieve Message announcement prompt. Retrieve Message - Call Types that involve message storage and require message retrieval by telephone are enabled to permit access; voice mail system 45 is an example. Alternatively, Retrieve Message - Call Types that do not require message retrieval by telephone are disabled to prevent inadvertent telephone attempts. An example is facsimile terminal 32 that prints facsimile copy but does not store it. Consequently, when the Retrieve Message - Call Type is enabled, it is included in the Retrieve Message prompting announcement as a reminder every time the Retrieve Message function is invoked until the associated Destination Address entry specified in Table 1 is successfully accessed by the Retrieve Message function. However, when the Retrieve Message - Call Type is disabled, there is no corresponding access of a Table 1 Destination Address to terminate the announcement. Consequently, a disabled Call Type Designation is included in the Retrieve Message prompting announcement only once.

Referring to Table 4 in FIG. 2d, the Message Waiting Indication (MWI) Destination Address entry is the phone number of a terminal device that is to receive MWI treatment. MWI treatment alerts a user of possible waiting messages and is initiated whenever a Leave Message function accesses a Table 1

Destination Address associated with a Voice Message, Facsimile Message, Electronic Mail Message, Voice Message Backup, Facsimile Message Backup, or Electronic Mail Message Backup Call Type Designation. The MWI treatment is accomplished by
5 either applying stutter dial-tone to the terminal device with MWI Destination Address in Table 4 or by turning on a message waiting light on the terminal device designated in Table 4. MWI treatment is terminated whenever an authorized user invokes the Retrieve Message function. The MWI Status entry in Table 4
10 is an internal variable that when set-on (Yes) indicates that MWI treatment has been invoked or when cleared-off (No) indicates no MWI treatment in effect.

The utilization of the route table of Tables 1 through 4 in FIGs. 2a
15 through 2d and the operation of the disclosed routing process of routing controller 20 are now described with reference to the process flow diagrams of FIGs. 3 through 9. Referring to FIG. 3, transition from step 200 to step 202 occurs when notification is received from switch 26 that an incoming call has accessed a
20 PTID. In step 202, the accessed PTID designation is used to obtain the route tables of Table 1 through 4 for the accessed PTID from routing control datastore 22. If at any time concurrent to all further steps described in FIGs. 3 through 9 the calling party that accessed the PTID goes on-hook, then any
25 further activity by routing controller 20 is immediately terminated for that call. In step 204 service circuit 24 is directed to initialize standard DTMF and facsimile calling tone reception. Concurrently, in step 204, service circuit 24 is directed to initiate an announcement prompt requesting Access Type selection by
30 the caller. The announcement prompts the caller with the accessed PTID and then prompts the caller to select an Access Type by inputting the numerical value of the desired Access Type Designation via telephone pushkey (e.g., "Hello, this is 555-1234. Please enter 1 to place a personal call, enter 2 to leave a
35 message, ..."). Only Access Type Designations with announced status in the Access Type Announced column of Table 1 are

included in the prompt. The concurrency in tone detection and announcement permits human callers to immediately enter DTMF digits without having to be inconvenienced while waiting for facsimile calling tone detection as is the case with commercial facsimile switching devices, for example. Concurrently, in step 204, a response timer is initiated to provide a time-out mechanism in case of no input. If a time-out occurs with no tone reception a transition to step 210 is made. In this step the prompting announcement of step 204 is terminated and two state variables, Route Access Type and Route Call Type, are set to the Access Type Designation and Call Type Designation specified by the Timeout Enabled entry in Table 1. An immediate transition to step 700 occurs to perform routing for the call. Step 700 will be explained in more detail later. If prior to the time-out of step 210, notification is received from service circuit 24 that incoming tone has been detected, a transition to step 214 occurs. In step 214, the timer and the prompting announcement of step 204 are terminated. Termination of the announcement in step 214 permits a human caller familiar with the announcement to enter a selected Access Type and proceed without having to wait for the announcement to finish. This approach also permits efficient handling of calls placed by automated calling facsimile device 40 or modem device 41 by proceeding with further route processing immediately upon detection of tone. If DTMF tone notification is received in step 214, any entry transmitted via DTMF signalling from the calling device is also automatically passed with the notification. DTMF tone may be received from calling phone 39, manually controlled calling facsimile device 40, or automated or manually controlled calling modem device 41. An automated calling facsimile device raises a calling tone that is detected by service circuit 24. Transition from step 220 to step 230 occurs if DTMF tone notification is received in step 214 or transition from step 220 to step 222 is made if facsimile calling tone notification is received in step 214. In step 222 the Route Type state variables are set to the Leave Message Access Type Designation and Facsimile

Message Call Type Designation of Table 1 to route an incoming call initiated by automated calling facsimile device 40. An immediate transition takes place from step 222 to step 700 to perform routing.

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In step 230, the DTMF entry received from the calling device is validated by matching against entries in the Access Type Designation column of Table 1; if the entry makes a match, it is valid and a transition to step 240 occurs; if no match can be made, the entry is invalid and the process transitions to step 236. In step 236, service circuit 24 is instructed to initiate a prompting announcement that the Access Type entry is invalid and a transition to step 204 occurs to restart the Access Type entry process. From step 240 a transition is made to one of steps 300, 400, 500 or 600 according to which of the four Access Type Designations in Table 1 has been selected by the caller. Steps 300, 400, 500, and 600 will be explained in more detail later.

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Referring to FIG. 4, entry step 300 immediately transitions to step 302 in which the Route Access Type state variable is set to the Personal Call Access Type Designation value from Table 1. Then a transition is made to step 304 in which the Route Call Type state variable is set to the Call Type Designation value that is enabled in the Call Type Enabled column of Table 1. In step 350 screening code entry, PIN 1, is processed to confirm validity. Step 350 will be explained in more detail later. If PIN 1 processing is valid, transition is made to step 370 which in turn is a direct transition to route processing step 700. Otherwise, a process restart is called for and transition is made to step 380 which is a direct transition to restart step 204.

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Referring to FIG 5, entry step 350 immediately transitions to step 352 in which the Screening Code Required entry in Table 1 is checked to determine if a screening code is required for the specified Call Type Designation. If no screening code is required, transition is made to return step 360 that designates the

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- 25 -

screening code as valid and an immediate return to the calling process function occurs. If screening code is required, transition is made to step 354 in which it is determined if screening code validation has previously been obtained during this call. If

5 validated previously, transition to step 360 occurs; if not yet validated, transition is made to step 356. In step 356, service circuit 24 is directed to initiate an announcement prompt requesting the caller to input a screening code or to input a restart indication ("#"). The restart indication entry permits the

10 caller to reselect another Access Type in case the caller has no screening code or has forgotten it. If the first entry collected is a restart indication, transition is made to the return step 362 that designates a process restart and an immediate return to the calling process function occurs. If the first entry collected is not

15 a restart indication, the remaining digits of the screening code are collected and validated by obtaining a match from the list of eligible screening codes in Tables 1 and 2. If the Route Access Type is Personal Call or Leave Message, the eligible screening codes PIN 1.1, PIN 1.2, etc., are obtained from Table 2. If the

20 Route Access type is Retrieve Message, PIN 2 in Table 1 is used as the eligible screening code; and if Modify Service is the Route Access Type, PIN 3 in Table 1 is used. If the screening code entry is valid transition to step 360 occurs. If the entry is invalid an announcement is initiated in step 356 to notify the

25 caller of this and then reprompt for screening code input. An entry is declared invalid either because no match could be found with the eligible screening codes in Table 1 or Table 2 or because a timer elapses with insufficient number of entry digits received.

30 Referring to FIG. 6, entry step 400 immediately transitions to step 402 in which the Route Access Type state variable is set to the Leave Message Access Type Designation value from Table 1. In step 410, service circuit 24 is directed to initiate an announcement prompting the caller to input the numerical value

35 of a desired Leave Message Access Type - Call Type Designation (e.g., " Enter 1 to leave a message with the secretary, 2 to page,

- 26 -

...") or to input a restart indication (#). Only Call Type Designations that have announce status in the Call Type Announced column of Table 1 are included in the prompt. Either on receipt of entry or on occurrence of time-out with no entry reception, the announcement is terminated and the entry is compared for a match with all Leave Message Call Type Designations that are enabled in the Call Type Enabled column of Table 1. If a match is made, transition to step 412 occurs. If no entry is made or no match can be made an announcement is initiated in step 410 to notify the caller of an invalid entry and then reprompt for Call Type Designation input. If a restart indication is received, transition to step 480 occurs which is a direct transition to restart step 204. In step 412 the Route Call Type state variable is set to the value of the Call Type Designation selected by the caller in step 410. In step 350 screening code entry, PIN 1 is processed. If PIN 1 processing is valid, transition to is made to step 470 which is a direct transition to route processing step 700. Otherwise, a process restart is required and transition is made to step 480 which is a direct transition to restart step 204.

Referring to FIG. 7, entry step 500 immediately transitions to step 502 in which the Route Access Type state variable is set to the Retrieve Message Access Type Designation value from Table 1. In step 504, if any Message Announce Status entry of Table 3 is set-on, transition occurs to step 506. In step 506, service circuit 24 is directed to initiate an announcement that informs a caller to "check for messages as follows" and then announces all Call Type Designations having Message Announce status set-on in Table 3. If while the prompt is in progress, DTMF entry is received, the prompt in step 506 is immediately terminated and cut-through transition is made to step 510 also bypassing the prompt for Call Type Designation input in step 508. After concluding the prompt in step 506, or if no Message Announce status is set-on in step 504, transition is made to step 508 in which service circuit 24 is directed to initiate an announcement

- 27 -

prompting the caller to input the numerical value of any Retrieve Message Access Type - Call Type Designation with announced status in Table 1 or to input a restart indication (#). Either on receipt of entry or on occurrence of time-out with no entry

5 reception, the announcement is terminated and transition is made to step 510. In step 510 the entry is compared for a match with all Retrieve Message Call Type Designations that are enabled in Table 1. If a match is made transition to step 512 occurs. If

10 no match can be made an announcement is initiated to notify the caller of the invalid entry and then a transition is made back to step 508 to reprompt for Call Type Designation input. If a restart indication is received transition to step 580 occurs which is a direct transition to restart step 204. If a valid Call Type

15 Designation is selected, transition to step 512 occurs in which the Route Call Type state variable is set to the value of the Call Type Designation selected by the caller in step 510. In step 350, screening code entry PIN 2 is processed. If PIN 2 processing requires a process restart, transition is made to step 580 which is a direct transition to restart step 204. If PIN 2 processing is

20 valid, transition is made to step 520. In step 520, if the MWI Status entry is set-on in Table 4 indicating that MWI treatment has been invoked, transition is made to step 522. In step 522, switch 26 is instructed to terminate MWI treatment on the terminal device having the phone number specified in the MWI

25 Destination Address entry of Table 4; also, the MWI Status entry of Table 4 is cleared to off. Transition from step 522 to step 530 then occurs. Also, in step 520, if the MWI Status entry in Table 4 is cleared-off, indicating no MWI treatment has been invoked, transition to step 530 occurs. In step 530, if the Message

30 Announce Status in Table 3 is not set-on for the current Route Call Type, transition is made to step 545. In step 545 routing control datastore 22 is updated with any modified entries from Tables 3 and 4. Then transition occurs to step 570 which is a direct transition to route processing step 700. If the Message

35 Announce Status is found set-on in step 530, transition is made to step 540. In step 540, if the current Route Call Type is

- 28 -

enabled in Table 1, transition is made to step 545; otherwise, if disabled, transition is made to step 542. In step 542, the Message Announce Status in Table 3 is cleared for the current Route Call Type. Then transition is made to step 545 and return
5 step 570. Terminating MWI treatment in step 522 and clearing the Message Announce Status in step 542 is performed after validating PIN 2 in step 350 to assure that an authorized person terminates MWI treatment and hears the appropriate announcement before it is discontinued.

10 Referring to FIG. 8, entry step 600 immediately transitions to step 602 in which the Route Access Type state variable is set to the Modify Service Access Type Designation value in Table 1. In step 350, screening code entry PIN 3 is processed. If PIN 3 processing
15 requires a process restart, transition is made to step 680 which is a direct transition to restart step 204. If PIN 3 processing is valid, transition occurs to step 604. In step 604, service circuit 24 is directed to initiate an announcement prompting a caller to input the numerical value of a desired Access Type Designation or
20 to input a restart indication. All Access Type Designation entries in Table 1 are included in the prompt message regardless of Access Type Announced entry value in Table 1. Receipt of entry or occurrence of time-out without entry causes termination of announcement and validation by matching the entry against all
25 Access Type Designation values in Table 1. If invalid, an invalid entry announcement is initiated and then the initial prompting announcement of step 604 is restarted to permit reentry. If the entry is valid, transition to step 610 occurs; if restart indication is received, transition to step 680 occurs. In step 610, service
30 circuit 24 is directed to initiate an announcement that prompts a caller to enter a "0" if modification of the Access Type selected in step 604 is desired or to specify the desired Call Type Designation to be modified or to enter a restart indication. All Call Type Designations for the Access Type selected in step 604 are
35 included in the prompt regardless of the value of Call Type Announced or Call Type Enabled entries in Table 1. Receipt of

- 29 -

entry or occurrence of time-out without entry causes termination of announcement and validation by matching the entry against all Call Type Designation values in Table 1 for the Access Type selected in step 604. If a "0" entry is received a transition to step 5 625 occurs to permit modification of capabilities of the Access Type Designation selected in step 604. If a restart indication is received, transition occurs to step 680. If the entry is invalid an invalid entry announcement is initiated and then the initial prompting announcement of step 610 is restarted to permit 10 reentry. If a valid Call Type Entry is received a transition to step 612 occurs in which the Route Call Type state variable is set to the Call Type Designation selected in step 610. Then a transition to step 620 occurs to permit modification of the parameters for the selected Call Type Designation. In step 620, service circuit 24 15 is directed to initiate an announcement that prompts the caller to specify a Call Type - Modification Type by inputting an appropriate numeric value (e.g., "enter 1 to modify Call Type Enable status, enter 2 to modify Screening Code Required status, enter 3 to modify Destination Address, enter 4 to modify Final 20 Treatment, enter 5 to modify Timeout Enable Status, enter 6 to modify Call Type Announced Status") or to enter a restart indication. On receipt of entry or time-out occurrence the announcement is terminated and the entry validated to be a value between 1 and 6. If the entry is not valid, an invalid entry 25 announcement is initiated and then the initial prompting announcement of step 620 is restarted. If restart indication is received, transition to step 622 occurs in which routing control datastore 22 is updated with any modifications made in steps 631 through 635. Then transition to step 680 occurs. If the entry is 30 valid, transition to step 630 occurs where transition to the selected Call Type - Modification Type function in steps 631 through 636 is accomplished.

In step 631, the Call Type Enabled status entry in Table 1 is 35 automatically toggled from enable to disable or vice-versa for a Leave Message - Call Type or a Retrieve Message - Call Type

- 30 -

specified in step 610; for a Personal Call - Call Type selected in step 610, the Call Type Enabled entry in Table 1 is enabled only since enabling one Personal Call - Call Type automatically disables all other Personal Call - Call Types. The caller is then prompted of the new status and transition to state 620 occurs for additional modification of the same Call Type Designation. In step 632, the Screening Code Required entry in Table 1 is automatically toggled from required to not required or vice-versa, the caller is prompted of the new status and transition to step 620 occurs. In step 633, the caller is prompted to enter appropriate numerical digits to specify the desired Destination Address in Table 1. A maximum of 10 digits may be entered; entry of less than 10 digits is terminated either by entry of "#" or time-out. The caller is prompted with an announcement of the new Destination Address value and transition to step 620 occurs. In step 634, for Personal Call - Call Types selected in step 610, the caller is prompted to select one of the Secretary, Voice Message or Pager Designations or to select no entry as the Final Treatment Designation entry in Table 1. For Leave Message - Call Types the caller is prompted to select no entry or the default Leave Message - Call Type Designation in Table 1. The caller is then prompted with the new Final Treatment Designation value and transition occurs to step 620. In step 635, the Timeout Enabled Status entry in Table 1 is enabled only since enabling the Timeout Enabled entry for one Call Type automatically disables it for all other Call Types. The caller is then prompted that Timeout Enabled Status is confirmed and transition to step 620 occurs. In step 636, the Call Type Announced Status entry is automatically toggled from announced to not announced or vice-versa, the caller is prompted with the new status and transition to step 620 occurs.

In step 625, service circuit 24 is directed to initiate an announcement that prompts the caller to specify an Access Type - Modification Type by inputting an appropriate numeric value (e.g., "enter 1 to modify Access Type Announced Status, enter 2

- 31 -

to modify Screening Code Designations") or to enter a restart indication. On receipt of entry or time-out occurrence the announcement is terminated and the entry is validated to be a 1 or 2. If the entry is not valid, an invalid entry announcement is initiated and then the initial prompting announcement of step 625 is restarted to permit reentry. If restart indication is received, transition to step 622 occurs in which routing control datastore 22 is updated with any modifications made in steps 641 or 642. If the entry is valid, transition to step 640 occurs where transition to the selected Access Type - Modification Type function in steps 641 and 642 is accomplished.

In step 641, the Access Type Announced status entry in Table 1 is automatically toggled from announced to not announced or vice-versa, the caller is prompted of the new status and a transition to state 625 occurs for additional modifications of the same Access Type Designation. In step 642 for Personal Call and Leave Message Access Types, the caller is prompted to indicate whether a new screening code is to be inserted or a current screening code deleted as a Screening Code Designation entry in Table 2. The caller is then prompted to enter appropriate numeric digits to designate a screening code value. The entry is terminated either by time-out or with entry of a prespecified required number of screening code digits. In case of insertion, the caller is prompted with the digit sequence of the entered code; in case of deletion, the caller is prompted with the entered code digit sequence and then notified that the entered code has been deleted or not found. A transition to state 625 then occurs. For Retrieve Message and Modify Service Access Types, step 642 only permits the caller to overwrite the single current Screening Code Designation entry, PIN 2 and PIN 3 respectively, in Table 1.

Referring to FIG. 9, entry step 700 immediately transitions to step 702 in which the Destination Address entry in Table 1 is obtained for the specified Route Access Type and Route Call Type state variables. In step 704, switch 26 is instructed to route the

- 32 -

- call to the Destination Address obtained in step 702. If answer notification is received indicating that the called party has answered, transition occurs to step 730. If restart indication is received, a transition occurs to step 780 which is an immediate transition to restart step 204. If answer notification does not occur within a prespecified time interval from initiation of step 704, the no answer alternative is invoked and transition to step 720 occurs.
- 10 In step 720, the Final Treatment Designation entry in Table 1 is checked to determine if Final Treatment has been specified for the Route Access Type and Call Type state variables. A transition to step 722 occurs if no Final Treatment is specified, while transition to step 724 occurs if Final Treatment is designated. In
- 15 step 722, the routing process waits to receive a restart indication from the caller; if a restart indication is received, a transition is made to step 780. While in either step 704 or step 722, the caller hears all continuing call progress tones and can force a restart by entering a restart indication. Consequently,
- 20 step 722 appears to the caller as a continuation of step 704. In step 724, the Route Call Type state variable is reset to the Final Treatment Designation entry in Table 1 and the Route Access Type state variable is reset to the Leave Message Access Type Designation. Then a transition to step 702 occurs to route
- 25 according to the Final Treatment Designation.
- In step 730, if the Route Access Type state variable is Personal Call, transition is made to step 900 in which the routing process of routing controller 20 is immediately terminated for this call.
- 30 If, in step 730, the Route Access Type is Retrieve Message, transition occurs to step 732. If, in step 732, the Message Announce Status entry in Table 3 is cleared-off for the current Route Type state variable, transition occurs to step 900 to terminate the process for the current call. If the Message
- 35 Announce Status entry is found set-on in step 732, transition occurs to step 734. In step 734, the Message Announce Status

- 33 -

entry in Table 3 for the current Route Type state variable is cleared and a transition to step 750 occurs. In step 750, routing control datastore 22 is updated with the modification made in step 734 and then the process is terminated for the current call.

5 in step 900. If, in step 730, the Route Access Type is Leave Message, transition occurs to step 740. If the Route Call Type is found to be Secretary or Pager in step 740, transition to step 900 occurs; otherwise transition is made to step 746. In step 746, switch 26 is instructed to initiate MWI treatment on the

10 destination terminal specified in the MWI Destination Address entry in Table 4. In addition, the MWI Status entry in Table 4 is set to on and the Message Announce Status entry in Table 3 is set to on for the current Route Type state variable. Finally a transition is made to step 750 to update routing control datastore

15 22 with the modifications of step 746 and a transition to step 900 terminates the process for the current call.

Although a certain preferred embodiment of the invention has been shown and described, it should be understood that many

20 changes and modifications may be made therein without departing from the scope of the invention.

We claim:

- 5 1. A method of controlling the routing of incoming calls to
a switch initiated from a calling terminal and accessing a special
telephone number, comprising the steps of:
 receiving a notification of the special telephone number
 being accessed,
10 in response thereto, initiating DTMF detection, initiating
facsimile calling tone detection, and initiating an announcement
prompt to the caller for access - type selection, and
 routing the incoming call to a destination terminal in
 response to facsimile calling tone detection or in response to
15 DTMF detection and in response to entry of access - type
selection from the calling terminal.
2. A method of controlling the routing of incoming calls as
set forth in Claim 1 wherein access - type selection includes:
20 personal calls,
 message store,
 message retrieve.
3. A method of controlling the routing of incoming calls as
25 set forth in Claim 2 wherein a personal call access - type
selection is routed to a destination terminal selected from the
group including:
 a local office terminal,
 a local residence terminal,
30 a local car terminal,
 a remote office terminal,
 a remote residence terminal, and
 a remote car terminal.

4. A method of controlling the routing of incoming calls as set forth in Claim 2 wherein a message store access - type selection is routed to a destination terminal from the group including:

- 5 an office terminal,
- a pager terminal,
- a voice message terminal,
- a facsimile message terminal, and
- an electronic-mail message terminal.

10

5. A method of controlling the routing of incoming calls as set forth in Claim 2 wherein a message retrieval access - type selection routes an incoming call to a destination terminal selected from the group including:

- 15 a voice message terminal,
- a facsimile message terminal,
- an electronic-mail message terminal,
- a voice message backup terminal,
- a facsimile message backup terminal, and
- 20 an electronic-mail message backup terminal.

6. A method of controlling the routing of incoming calls as set forth in Claim 1 including the step of identifying a destination address in response to incoming facsimile calling tone detection
25 or in response to DTMF detection and in response to entry of access - type selection from the calling terminal.

7. A method of controlling the routing of incoming calls as set forth in Claim 1 including the steps of:
30 timing the elapsed time from the initiation of an announcement prompt to the caller, and
 in response to a lack of entry of an access - type selection, routing the incoming call to a preselected destination terminal.

- 36 -

8. A method of controlling the routing of incoming calls as set forth in Claim 1 including the steps of:

5 timing the response of a destination terminal to determine if a response has been made at the destination terminal, and
 in response to a no-answer condition within a designated time interval routing the incoming call to a backup destination terminal.

9. A method of controlling the routing of incoming calls as set forth in Claim 1 wherein the incoming call is routed to a destination terminal local to or remote from the switch.

10. A method of controlling the routing of incoming calls as set forth in Claim 1 wherein the incoming call is transferred to a backup destination terminal when the primary destination terminal is not available for accessing.

11. A method of controlling the routing of incoming calls as set forth in Claim 1 including the step of blocking the incoming call from routing until the entry of a screening code from the calling terminal.

12. A method of controlling the routing of incoming calls set forth in Claim 1 including the steps of:

25 reinitiating the announcement prompt to the caller for access - type selection in response to entry of restart indication from the calling terminal, and
 rerouting the incoming call to a destination terminal in response to facsimile calling tone detection or in response to
30 DTMF detection and in response to reentry of access - type selection from the calling terminal.

- 37 -

13. A method of controlling the routing of incoming calls to a switch initiated from a calling terminal and accessing a telephone number, comprising the steps of:

5 receiving a notification of the telephone number being accessed,

in response thereto, initiating DTMF detection, initiating facsimile calling tone detection, and initiating an announcement prompt to a caller for access - type selection, and

10 modifying route table parameters in response to DTMF detection and in response to entry of access - type selection from the calling terminal or routing the incoming call to a destination terminal in response to facsimile calling tone detection or in response to DTMF detection and in response to entry of access - type selection from the calling terminal.

15

14. A method of controlling the routing of incoming calls set forth in Claim 13 wherein access - type selection includes:

20 personal calls,
message store, and
message retrieve.

15. A method of controlling the routing of incoming calls set forth in Claim 14 wherein route table parameter modification includes changing the selection of the destination terminal for
25 the personal call access - type.

16. A method of controlling the routing of incoming calls set forth in Claim 13 wherein route table parameter modification includes destination address changes.

30

17. A method of controlling the routing of incoming calls set forth in Claim 13 wherein route table parameter modification includes final treatment changes.

35

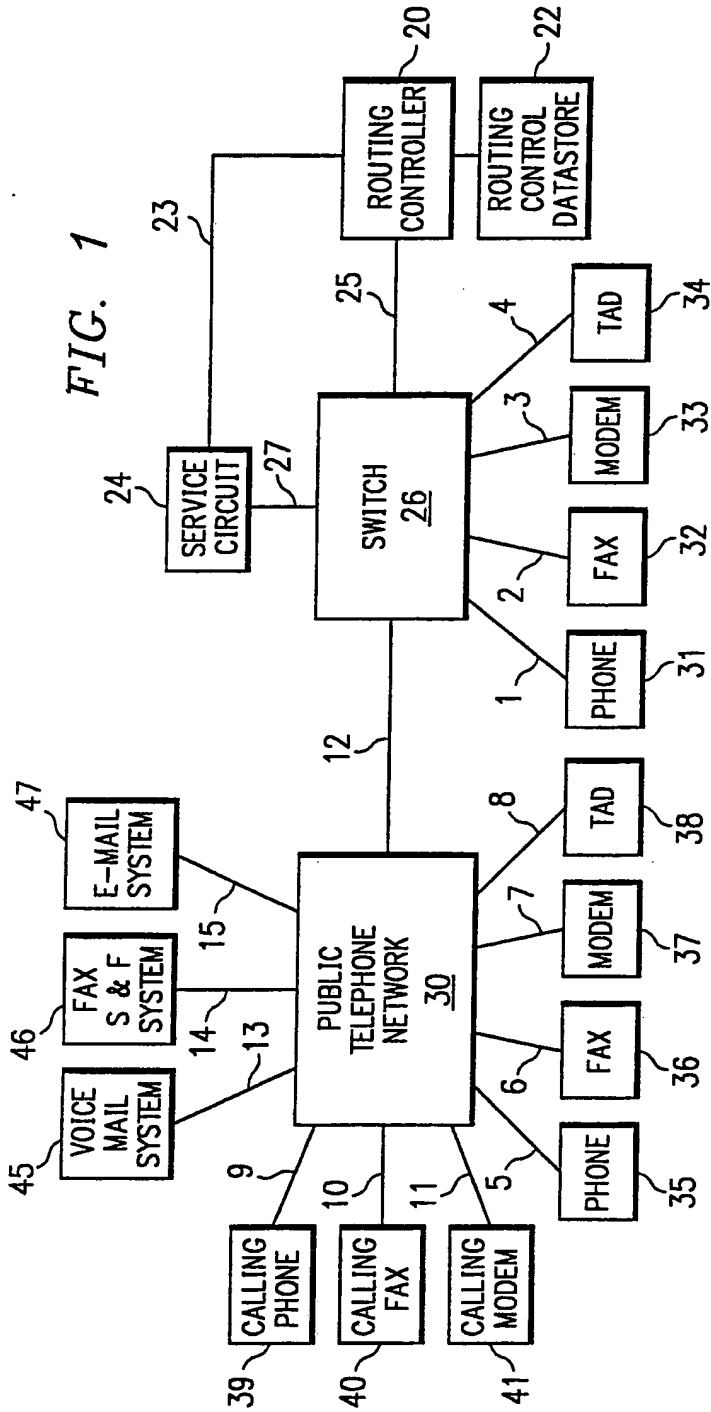
- 38 -

18. A method of controlling the routing of incoming calls set forth in Claim 13 wherein route table parameter modification includes changing of screening codes.

5 19. A method of controlling the routing of incoming calls set forth in Claim 13 wherein route table parameter modification includes configuring of prompting announcements.

10 20. A method of controlling the routing of incoming calls set forth in Claim 13 wherein the incoming call is transferred to a backup destination terminal when the primary destination terminal is not available for accessing.

1/7



SUBSTITUTE SHEET

FIG. 2b

TABLE 2

| NO. OF ENTRIES |
|----------------|
| PIN1.1 |
| PIN1.2 |
| . |
| . |
| . |
| PIN1.N |

FIG. 2c

TABLE 3

| CALL TYPE DESIGNATION | MESSAGE ANNOUNCE STATUS |
|-----------------------|-------------------------|
| VOICE MSG | Y/N |
| FAX MSG | Y/N |
| E-MAIL MSG | Y/N |
| VOICE MSG BKUP | Y/N |
| FAX MSG BKUP | Y/N |
| E-MAIL MSG BKUP | Y/N |

FIG. 2d

TABLE 4

| MWI DESTINATION ADDRESS | PHONE |
|-------------------------|-------|
| MWI STATUS | Y/N |

2/7

FIG. 2a

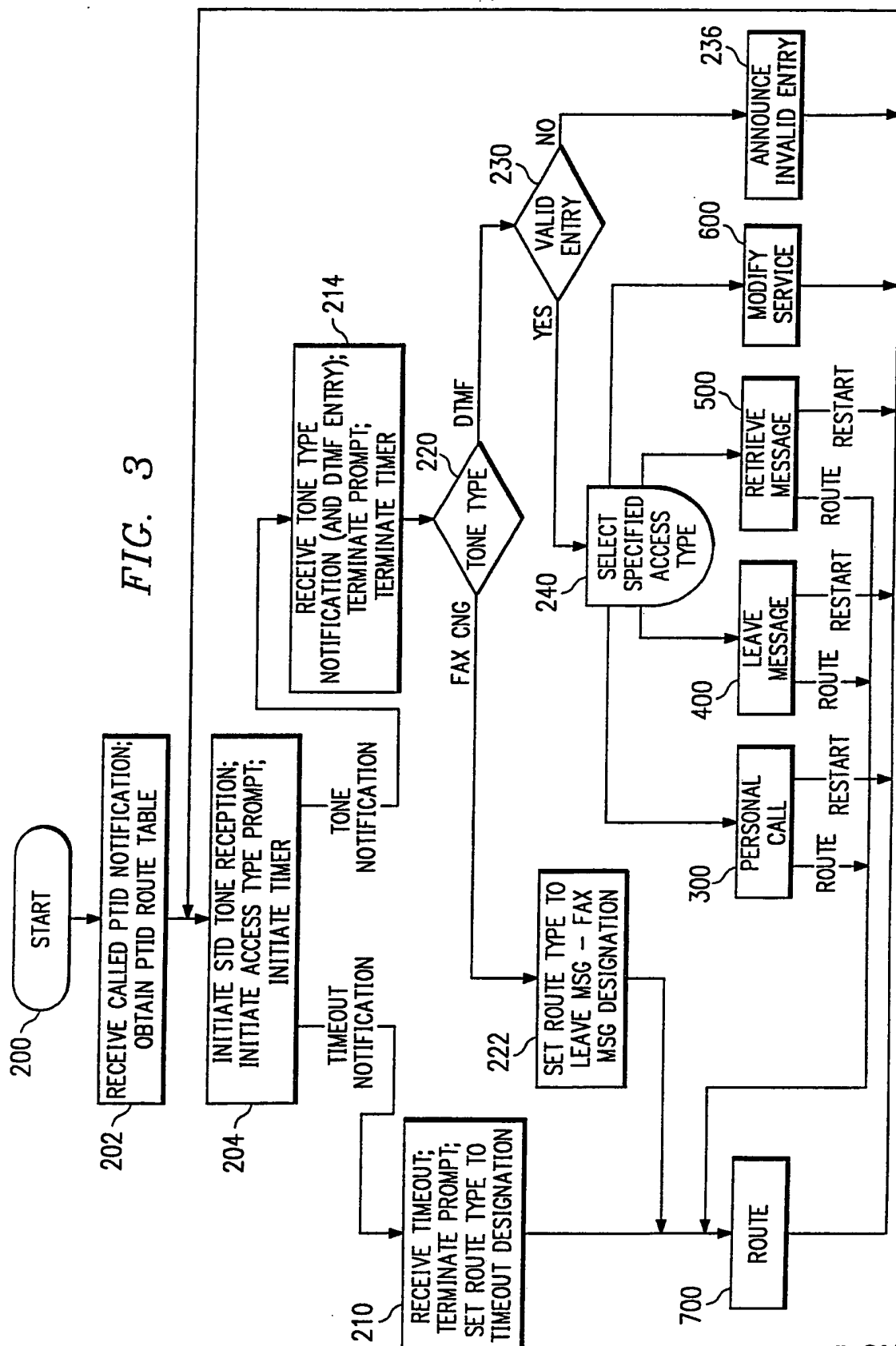
TABLE 1

| ACCESS TYPE | | CALL TYPE | | TIMEOUT ENABLED | SCREENING CODE | | DESTINATION ADDRESS | FINAL TREATMENT DESIGNATION |
|----------------|-----------|-------------------|-----------|--------------------|----------------|-------------|------------------------|--------------------------------|
| DESIGNATION | ANNOUNCED | DESIGNATION | ANNOUNCED | | REQUIRED | DESIGNATION | | |
| PERSONAL CALL | Y/N | PRIVATE LINE | N | Y/N | Y/N | PIN1 | PHONE/SPC CODE | .../SEC/V·MSG/PAGER |
| | | LOCAL OFFICE | N | Y/N | Y/N | TABLE | PHONE/SPC CODE | .../SEC/V·MSG/PAGER |
| | | LOCAL RESIDENCE | N | Y/N | Y/N | POINTER | PHONE/SPC CODE | .../SEC/V·MSG/PAGER |
| | | LOCAL CAR | N | Y/N | Y/N | | PHONE/SPC CODE | .../SEC/V·MSG/PAGER |
| | | REMOTE OFFICE | N | Y/N | Y/N | | PHONE/SPC CODE | .../SEC/V·MSG/PAGER |
| | | REMOTE RESIDENCE | N | Y/N | Y/N | | PHONE/SPC CODE | .../SEC/V·MSG/PAGER |
| | | REMOTE CAR | N | Y/N | Y/N | | PHONE/SPC CODE | .../SEC/V·MSG/PAGER |
| | | SECRETARY | Y/N | Y/N | Y/N | PIN1 | PHONE/SPC CODE | .../VOICE MSG |
| LEAVE MSG | Y/N | PAGER | Y/N | Y/N | Y/N | TABLE | PHONE/SPC CODE | .../VOICE MSG |
| | | VOICE MSG | Y/N | Y/N | Y/N | POINTER | PHONE/SPC CODE | .../VOICE MSG BKUP |
| | | FAX MSG | Y/N | Y/N | Y/N | | PHONE/SPC CODE | .../FAX MSG BKUP |
| | | E-MAIL MSG | Y/N | Y/N | Y/N | | PHONE/SPC CODE | .../E-MAIL MSG BKUP |
| | | VOICE MSG BACKUP | N | Y/N | Y/N | | PHONE/SPC CODE | ... |
| | | FAX MSG BACKUP | N | Y/N | Y/N | | PHONE/SPC CODE | ... |
| | | E-MAIL MSG BACKUP | N | Y/N | Y/N | | PHONE/SPC CODE | ... |
| | | VOICE MSG | Y/N | Y/N | Y/N | PIN2 | PHONE/SPC CODE | ... |
| RETRIEVE MSG | Y/N | FAX MSG | Y/N | Y/N | Y/N | | PHONE/SPC CODE | ... |
| | | E-MAIL MSG | Y/N | Y/N | Y/N | | PHONE/SPC CODE | ... |
| | | VOICE MSG BACKUP | Y/N | Y/N | Y/N | | PHONE/SPC CODE | ... |
| | | FAX MSG BACKUP | Y/N | Y/N | Y/N | | PHONE/SPC CODE | ... |
| | | E-MAIL MSG BACKUP | Y/N | Y/N | Y/N | | PHONE/SPC CODE | ... |
| | | ... | ... | Y | Y | PIN3 | ... | ... |
| MODIFY SERVICE | Y/N | ... | ... | Y | Y | | | ... |

... INDICATES NO ENTRY

3/7

FIG. 3



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4/7

FIG. 4

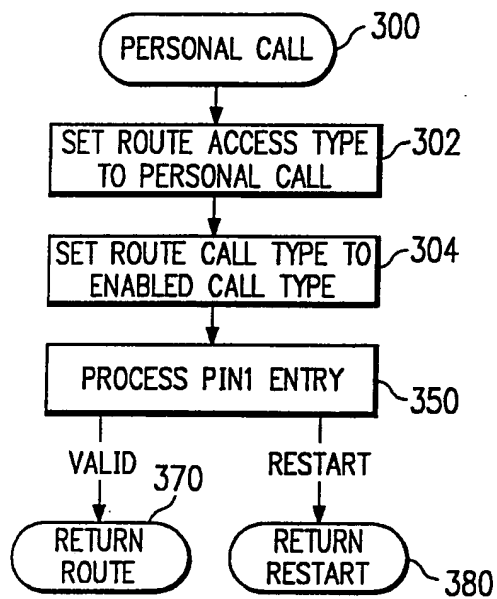


FIG. 5

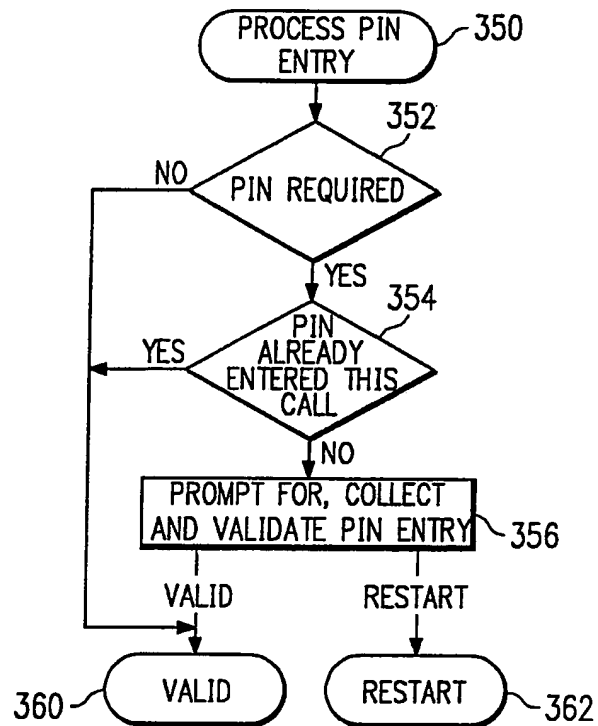
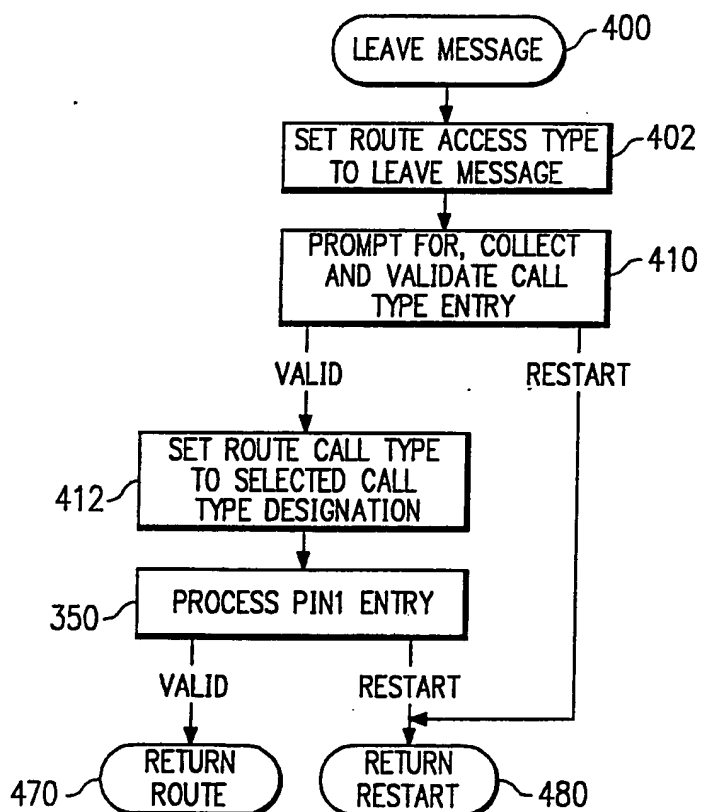


FIG. 6



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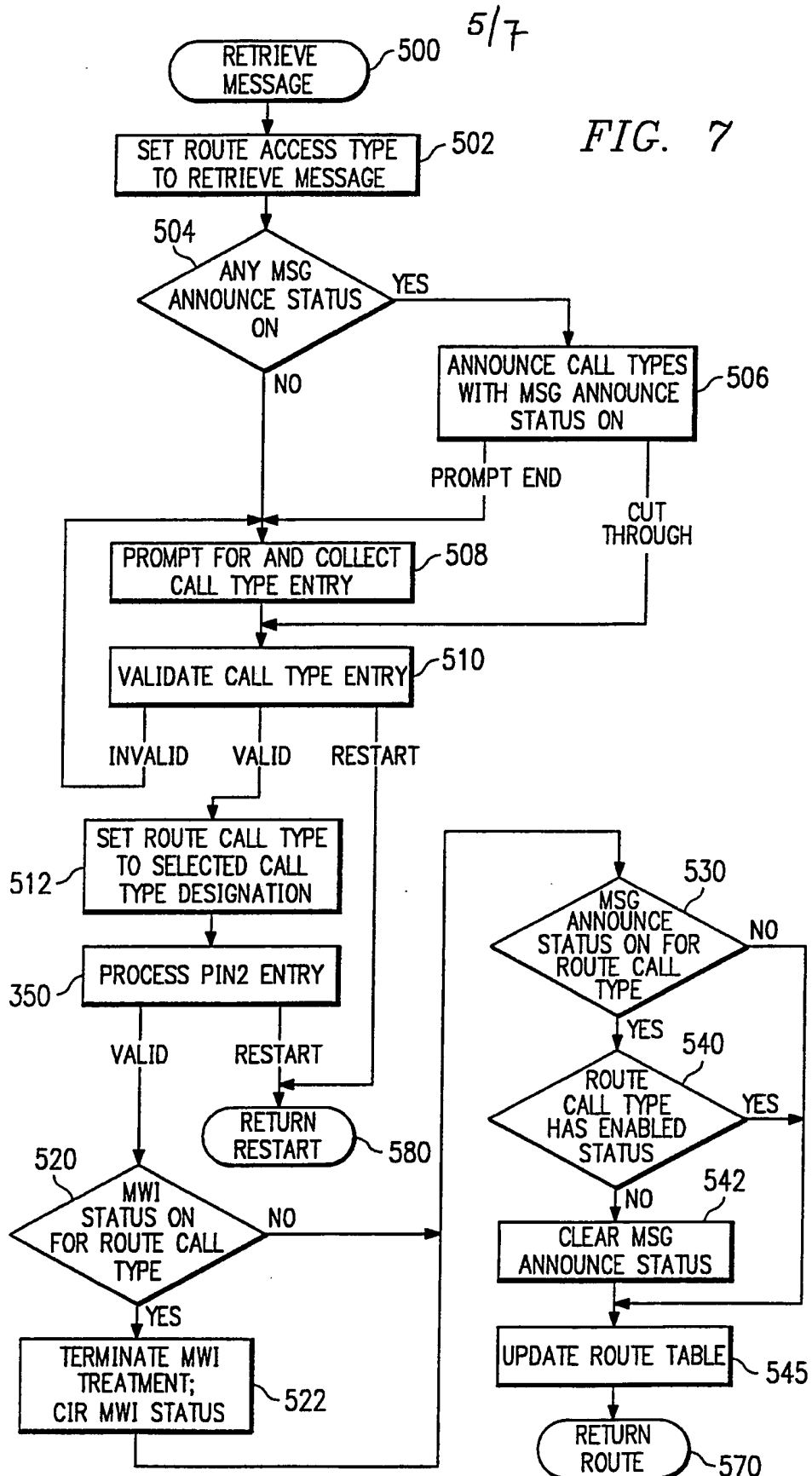
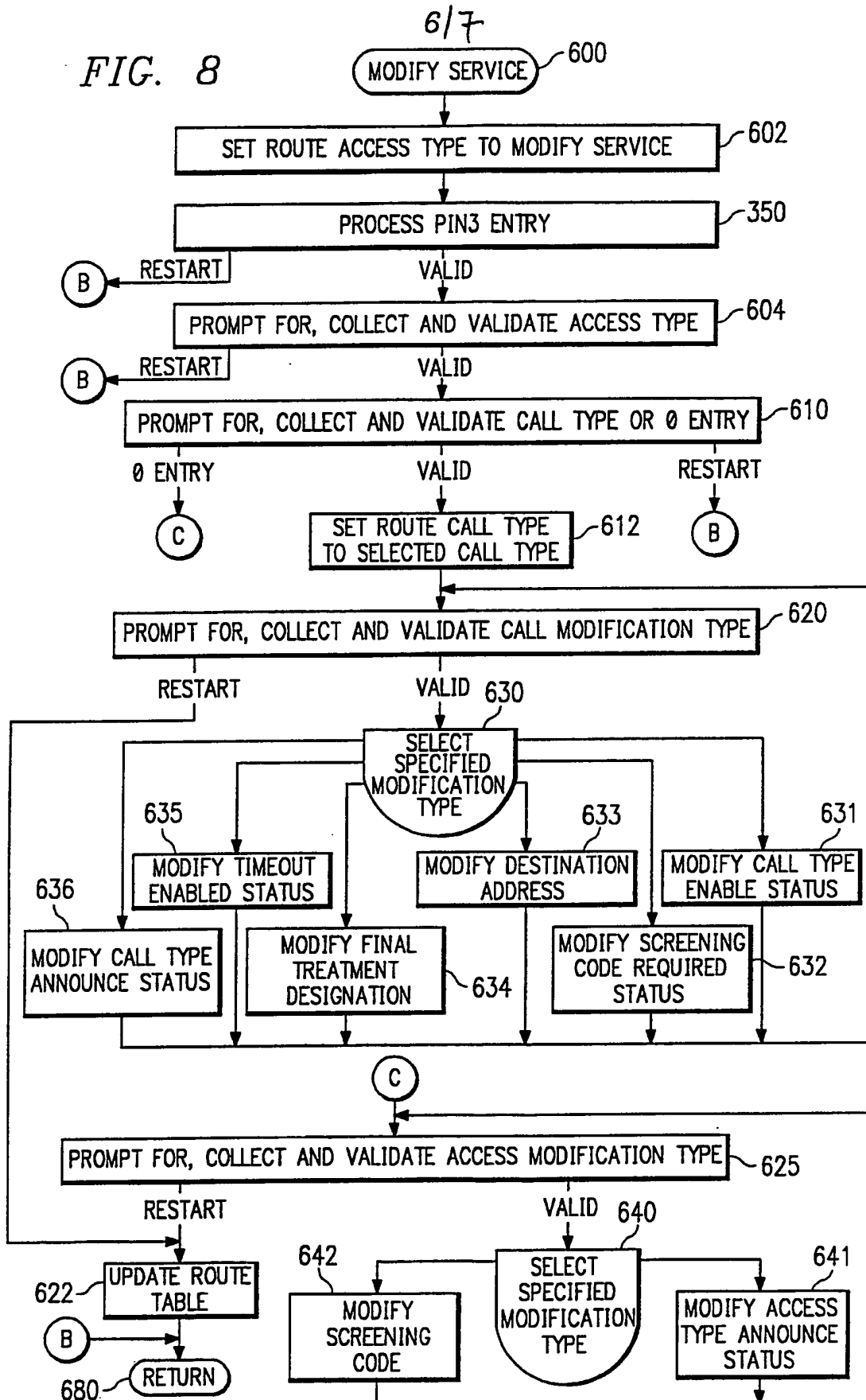
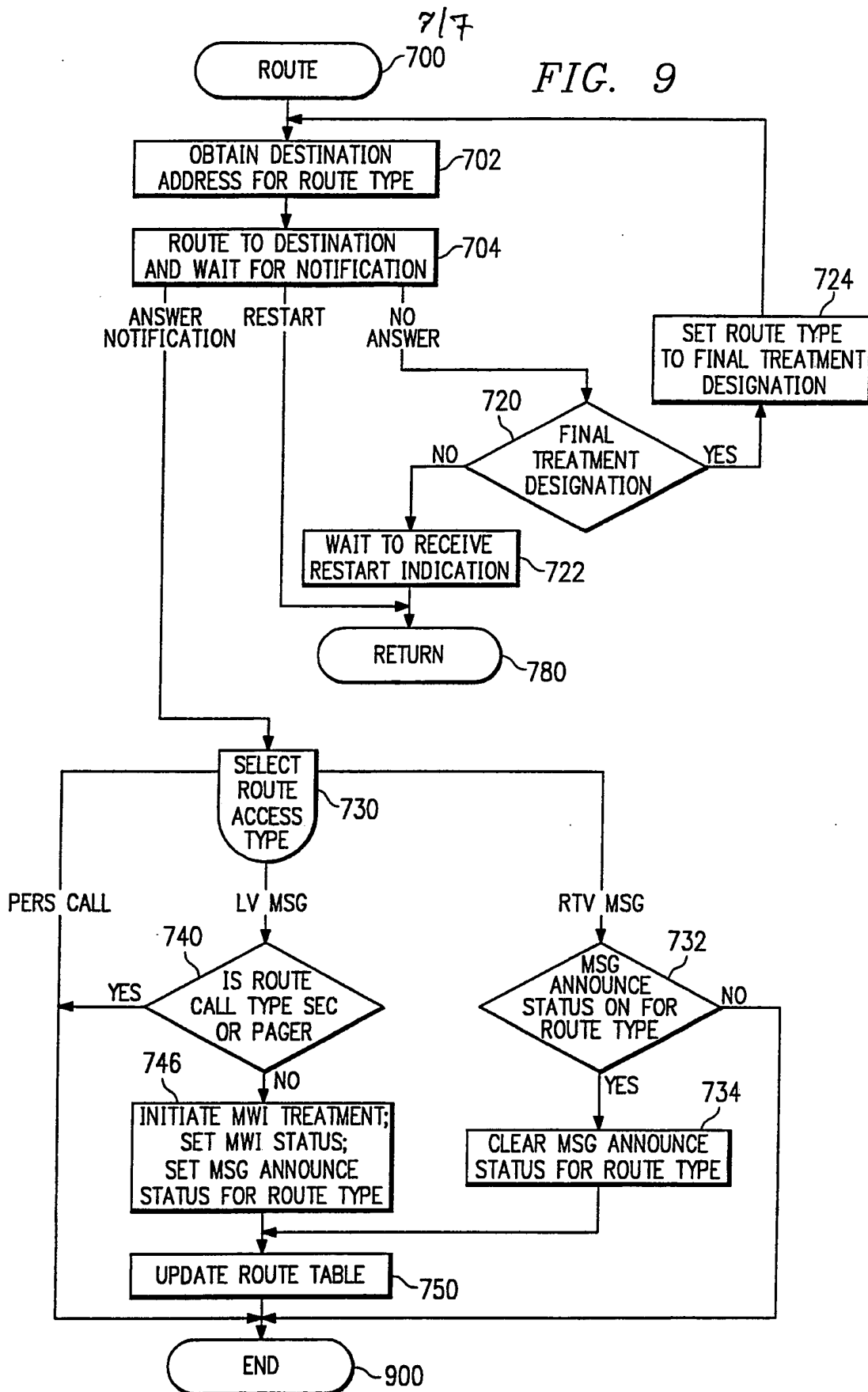


FIG. 8



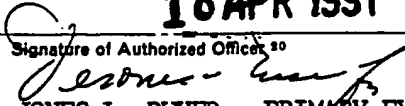
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FIG. 9



INTERNATIONAL SEARCH REPORT

International Application No PCT/US91/00483

| | | |
|--|--|-------------------------------------|
| I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ³ | | |
| According to International Patent Classification (IPC) or to both National Classification and IPC IPC(5) H04M 11/00, 3/42 US CL 379/88 | | |
| II. FIELDS SEARCHED | | |
| Minimum Documentation Searched ⁴ | | |
| Classification System | Classification Symbols | |
| US CL. | 379/58, 59, 60, 67, 88, 89, 93, 100, 201, 210, 211, 212, 214 | |
| Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁵ | | |
| | | |
| III. DOCUMENTS CONSIDERED TO BE RELEVANT ¹⁴ | | |
| Category ⁶ | Citation of Document, ¹⁶ with indication, where appropriate, of the relevant passages ¹⁷ | Relevant to Claim No. ¹⁸ |
| Y, P | US, A, 4,926,462 (LADD ET AL.) 15 MAY 1990 See abstract and col. 5, lines 14-59: in general, however, entire document is relevant. | 1-20 |
| Y | Technology Concepts, Inc. brochure "The Fax Line Manager", 1989. See Figure depicting "Installation with phone system (PBX or KSU)"; in general, however, entire document is relevant. | 1-20 |
| <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>¹⁵ Special categories of cited documents:</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 45%;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"&" document member of the same patent family</p> </div> </div> | | |
| IV. CERTIFICATION | | |
| Date of the Actual Completion of the International Search ¹⁹ 11 MARCH 1991 International Searching Authority ¹ TSA/US | Date of Mailing of this International Search Report ² <div style="text-align: center; font-size: 1.2em; font-weight: bold;">18 APR 1991</div> <div style="text-align: center;">  Signature of Authorized Officer ²⁰ JONES L. DWYER - PRIMARY EXAMINER </div> | |